

Applications of Nanotechnology in Food Safety

Frans Kampers



University Contract Research Organisation (CRO)
...to explore the potential of nature. Facts and Figures (2008)
One of the largest research organisations 6220
on food and nutrition in the world. University students 5617.
to improve the quality of life. Revenues: 662 M€

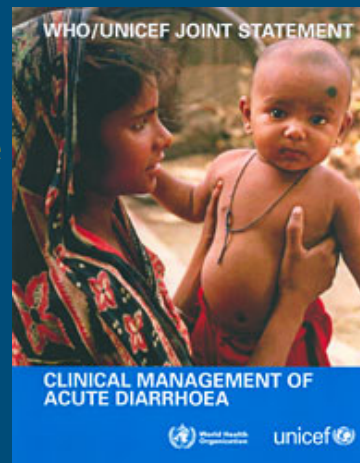


Food safety



Food safety: a global challenge

- Developing countries:
As high as 2-4 Million children die every year of diarrhoea-type diseases
- Developed countries:
Costs are >10-15 G\$/ year for hospitalization and medical treatment

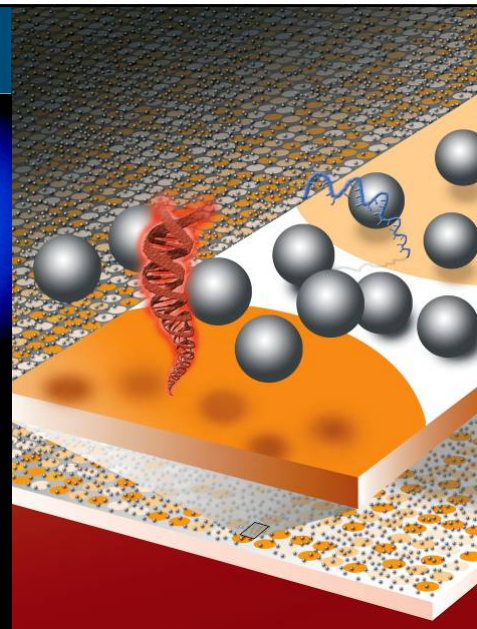


WHO Global Strategy for Food Safety, 2002

Food Quality and Safety



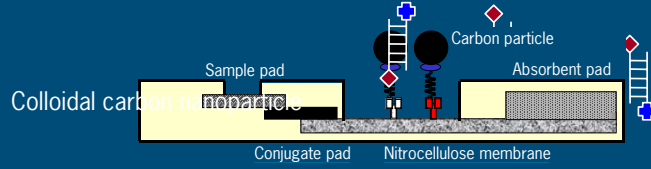
Microarrays



Agilent

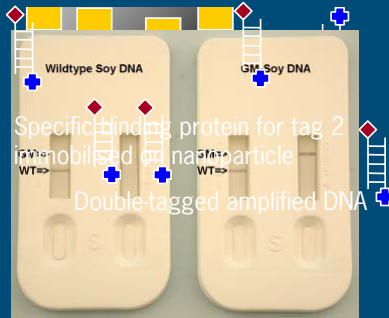
Illustration Flavio Robles, Berkeley Lab Public Affairs

Nucleic Acid Lateral Flow ImmunoAssay (NALFIA)

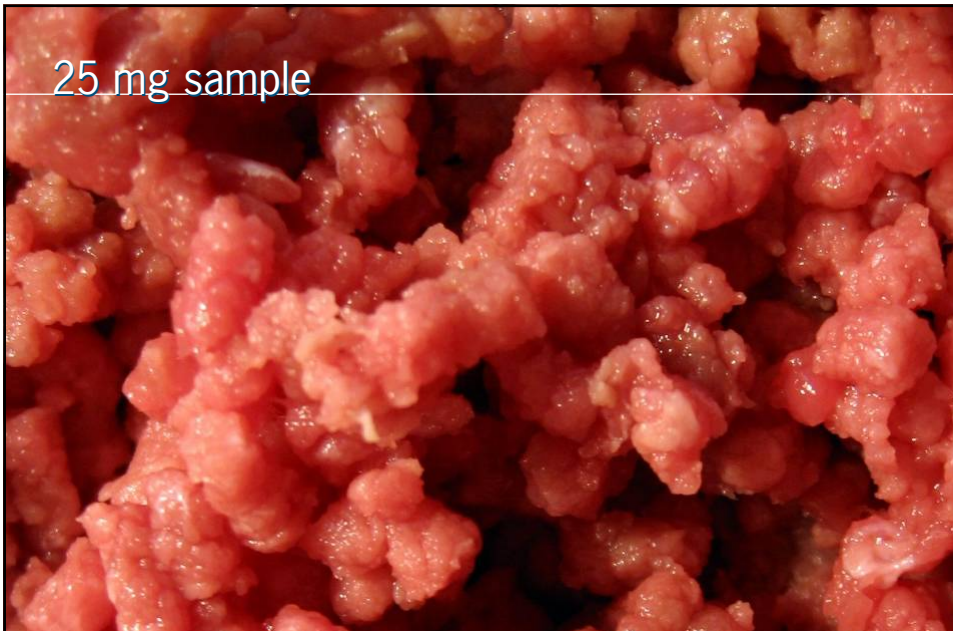


Specific antibody for tag 1
immobilised on membrane

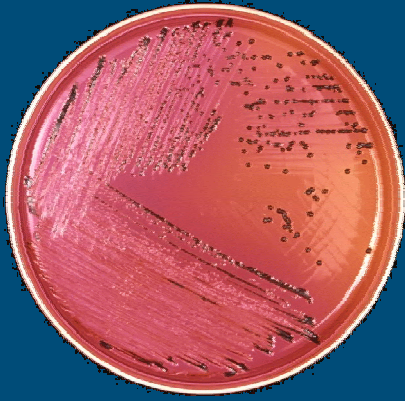
Nitrocellulose membrane



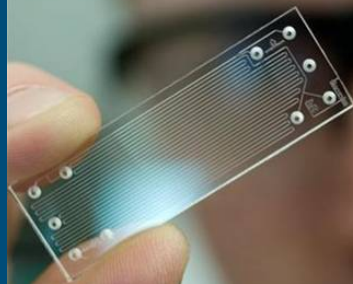
25 mg sample



Food safety assurance



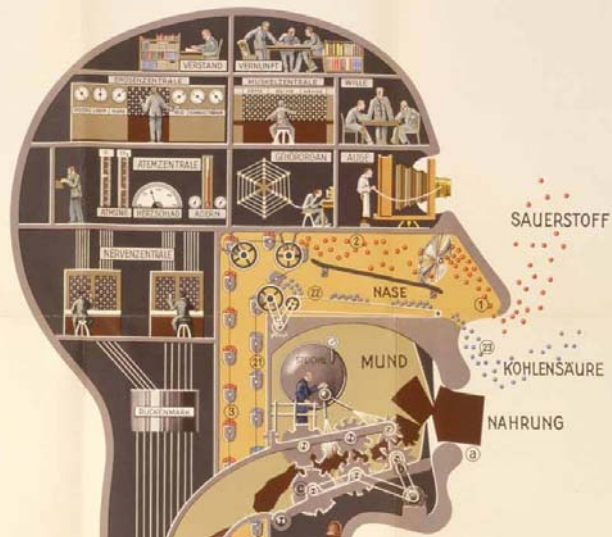
Micro and nanotechnologies



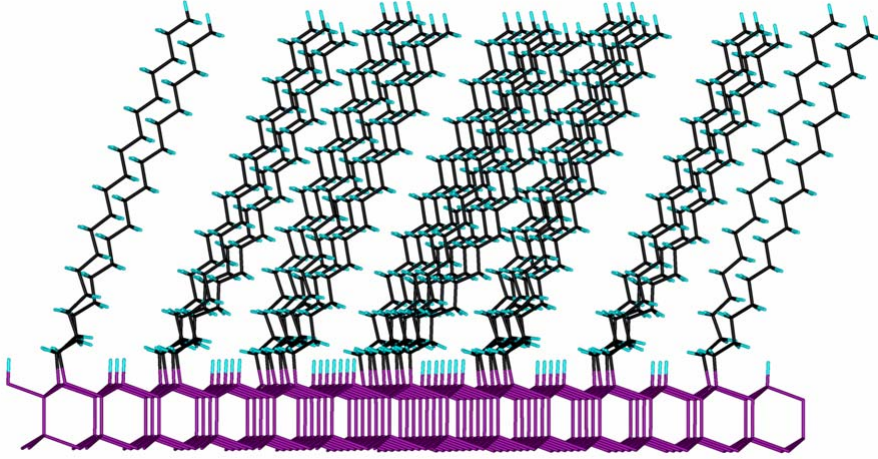
Sensing volatiles



Electronic nose

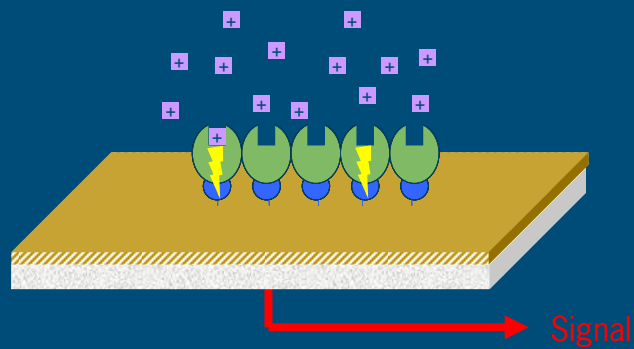


Organic monolayer on silicon



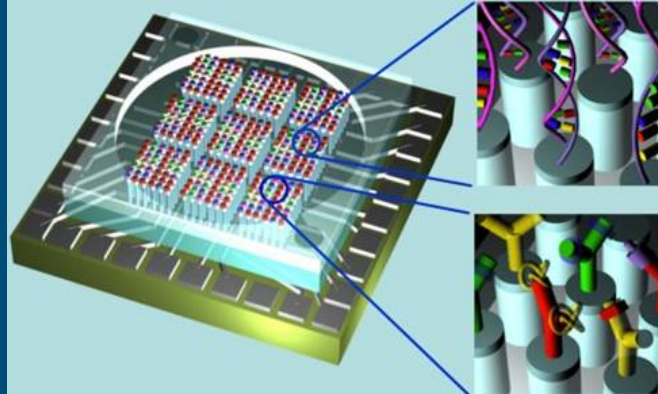
Han Zuilhof – Organic Chemistry

Food Quality and Safety



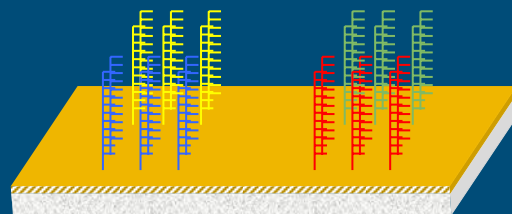
Maarten Jongsma – PRI

Sensor array



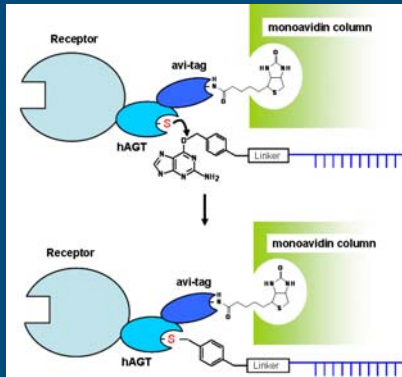
NASA Ames Research Center

Writing the addresses



Maarten Jongma – PRI

Receptors with address label



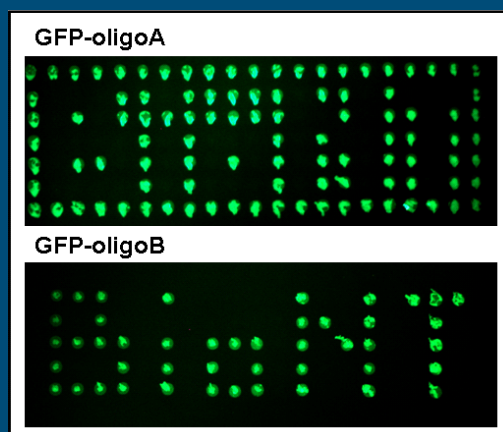
SnapTag: www.covalys.com



Maarten Jongsma – PRI



Proof of principle



Maarten Jongsma – PRI

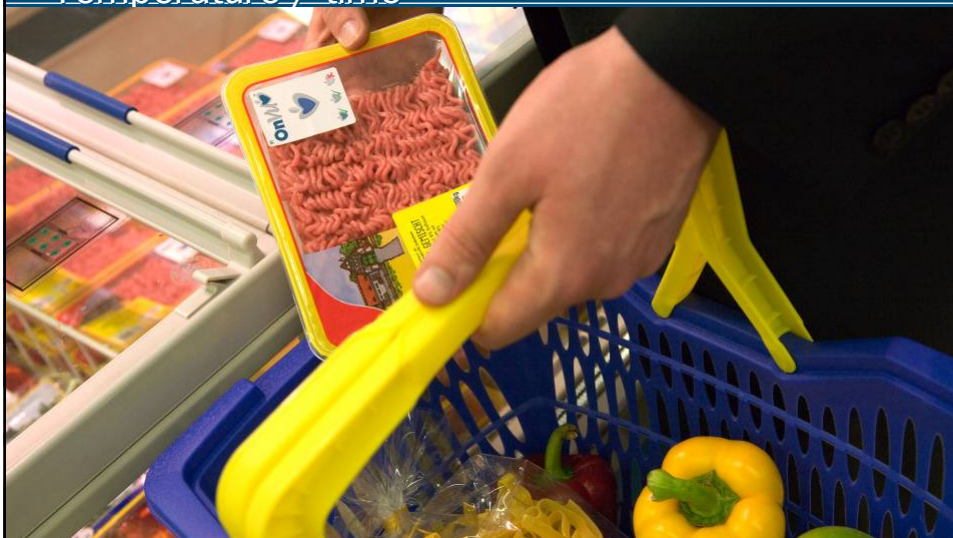


Jongsma and Litjens,
Proteomics 6: 2650-2655 (2006)

Packaging and information



Temperature / time



Pathogens and micro-organisms

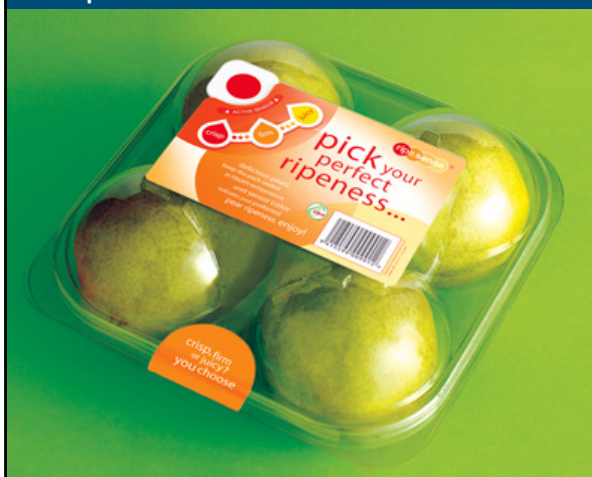


- Listeria
- E. coli
- Salmonella
- Campylobacter

www.toxinalert.com



Ripeness



This pear is red.
crisp



This one's orange.
firm



And this one's yellow.
juicy

To find your perfect pear, just look for the ripeSense™ sensor.

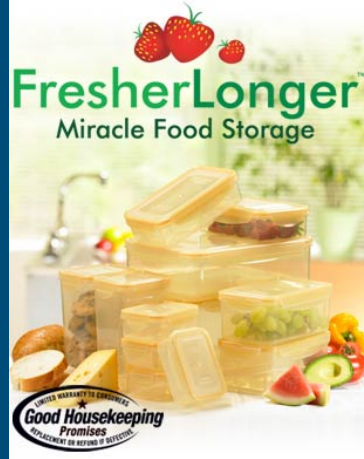
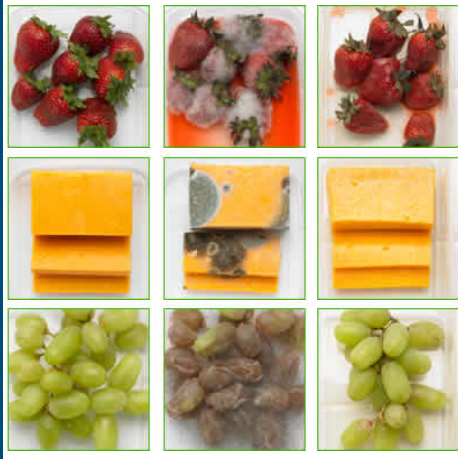
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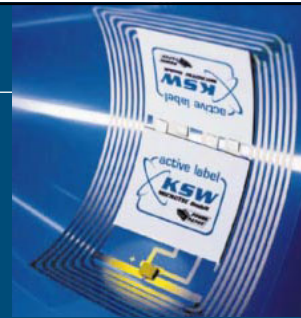
Nanosilver



After 8 days

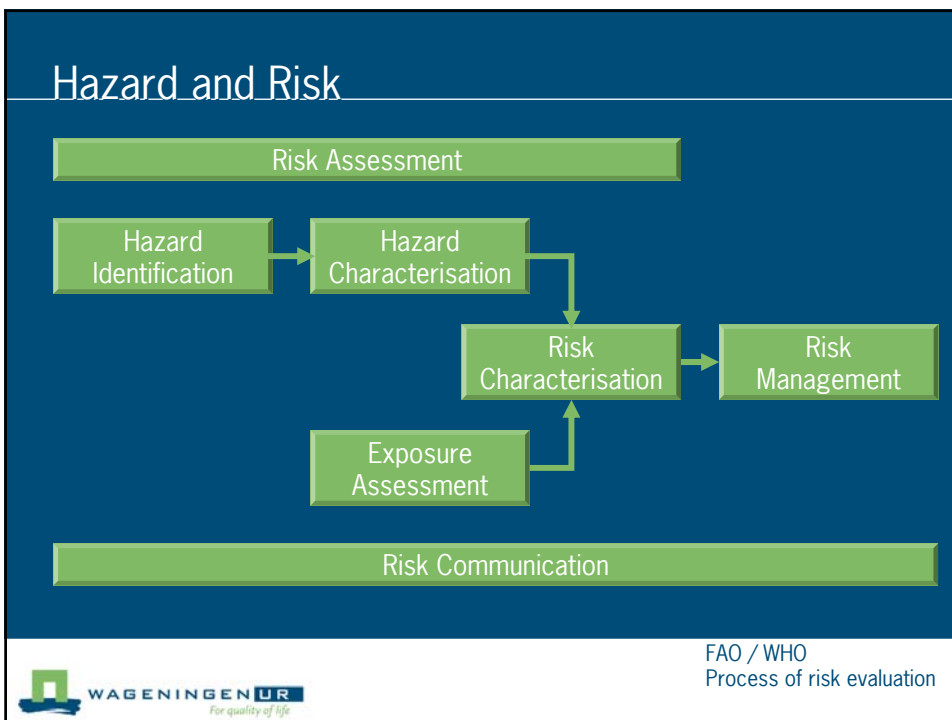


Radio Frequency Identification



KSW Tempsense®

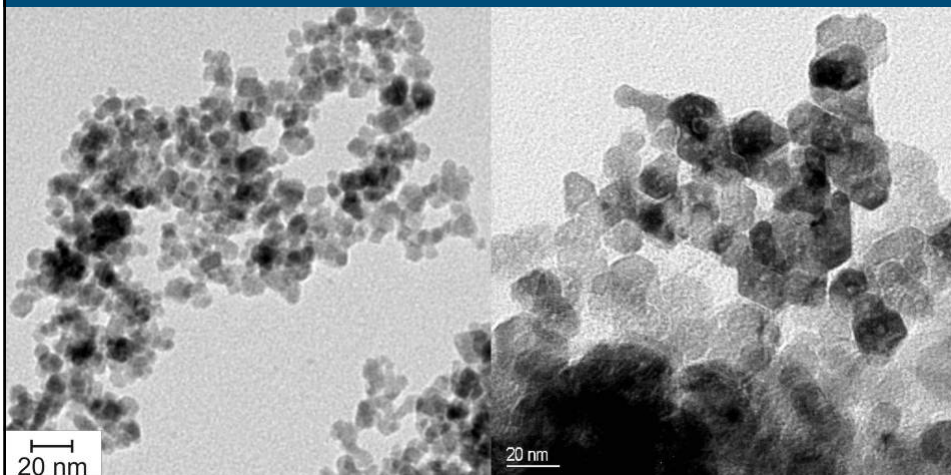




Risk assessment



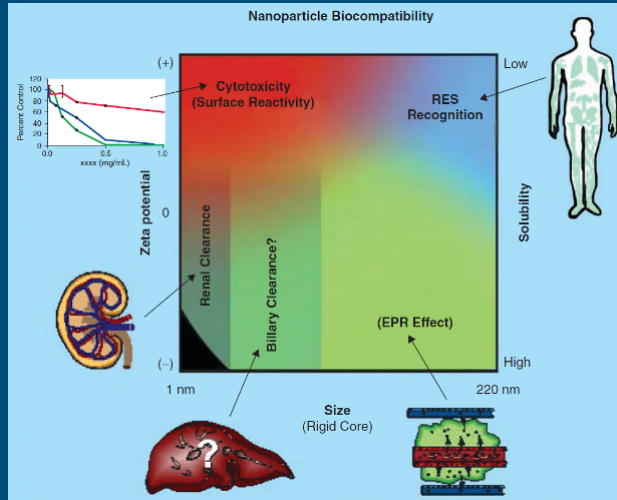
Hazard characterisation



Fe_3O_4 (9 nm)

ZnO (20 nm)

Properties of nanoparticles affecting toxicity

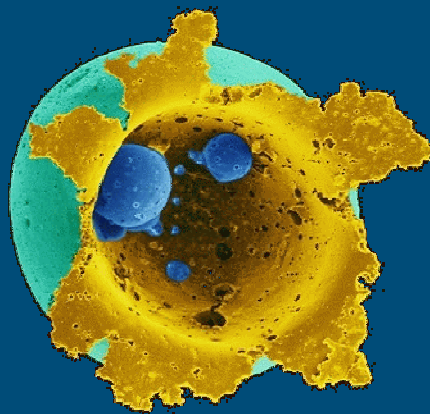


Scott McNeil
Nanotechnology
Characterization Lab
NCI - NIH



www3.interscience.wiley.com/journal/121524295/home

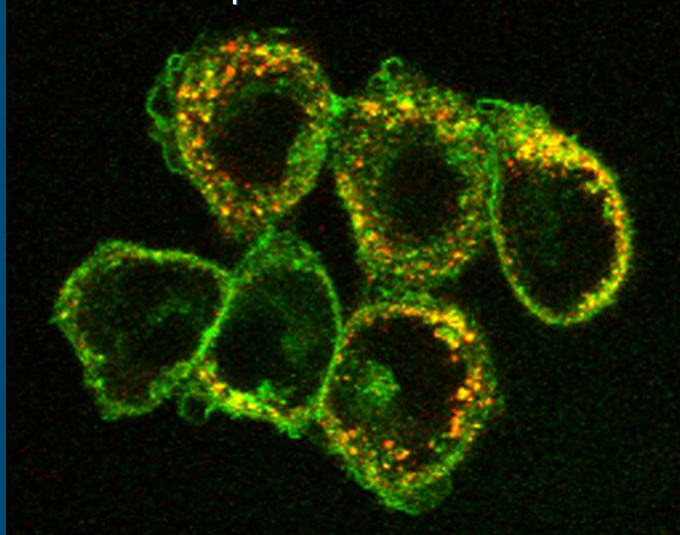
Biodegradability



David McCarthy / Science Photo Library



Detection of nanoparticles



Detection of nanoparticles

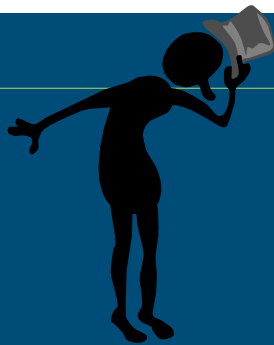


Acknowledgements

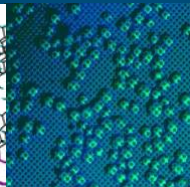
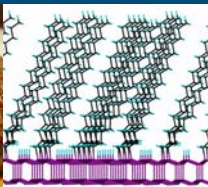
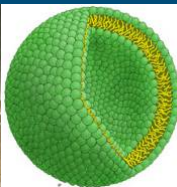
Many researchers
from the groups of:

- Aart van Amerongen
- Lynn Frewer
- Maarten Jongsmā
- Ivonne Rietjens
- Cees van Rijn
- Han Zuilhof

All the people whose pictures I have used



Thank you



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